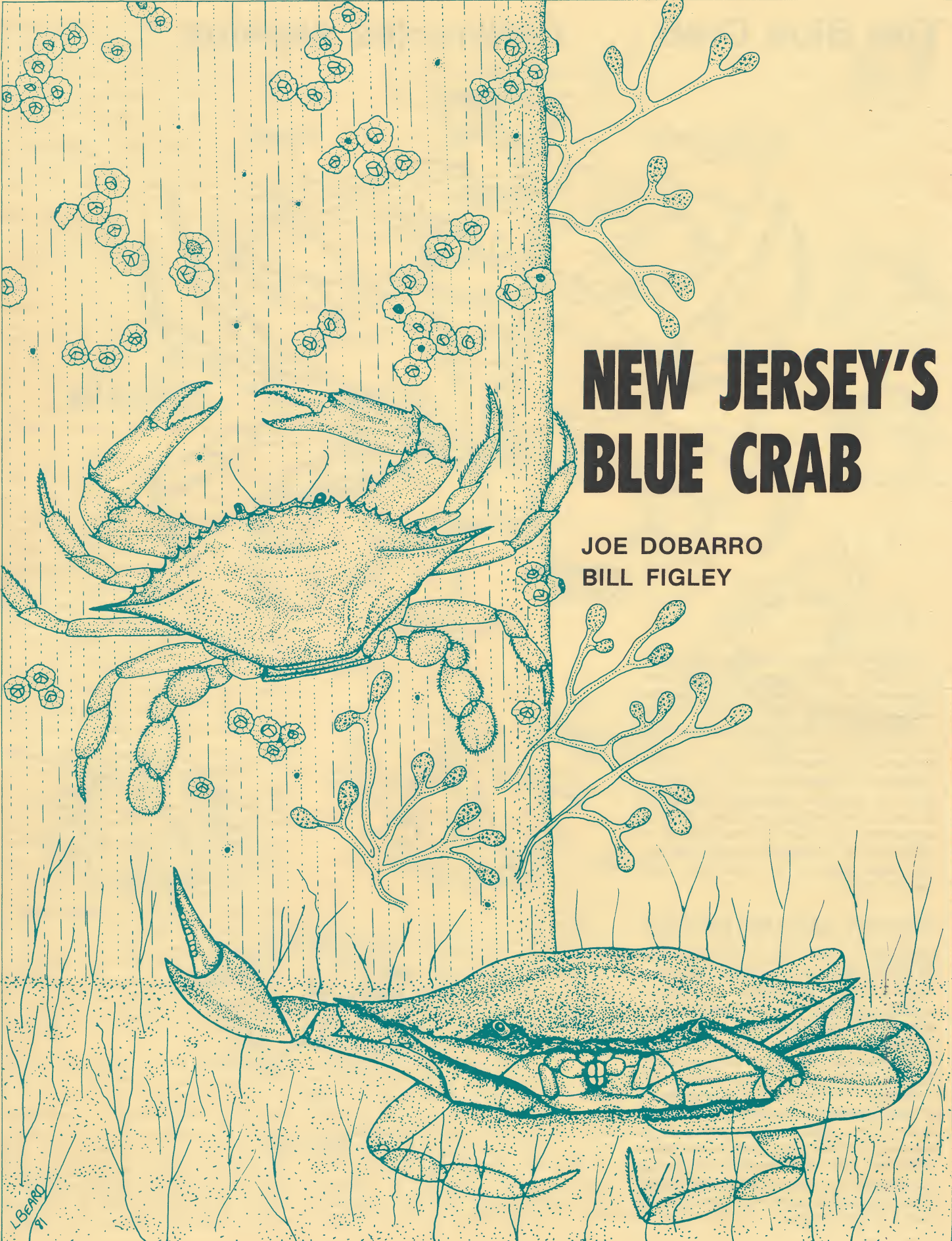


A detailed black and white line drawing of two blue crabs in their natural habitat. The top crab is shown from a dorsal view, facing left, with its large claws raised. The bottom crab is shown from a ventral view, facing right, with its claws lowered. The background features a vertical line representing a shoreline or a post, with various marine life including small, round, potted organisms (possibly limpets or anemones) and branching, leafy structures (possibly seaweed or coral). The bottom of the image is filled with tall, thin grasses.

NEW JERSEY'S BLUE CRAB

**JOE DOBARRO
BILL FIGLEY**

The Blue Crab . . . *Callinectes sapidus*

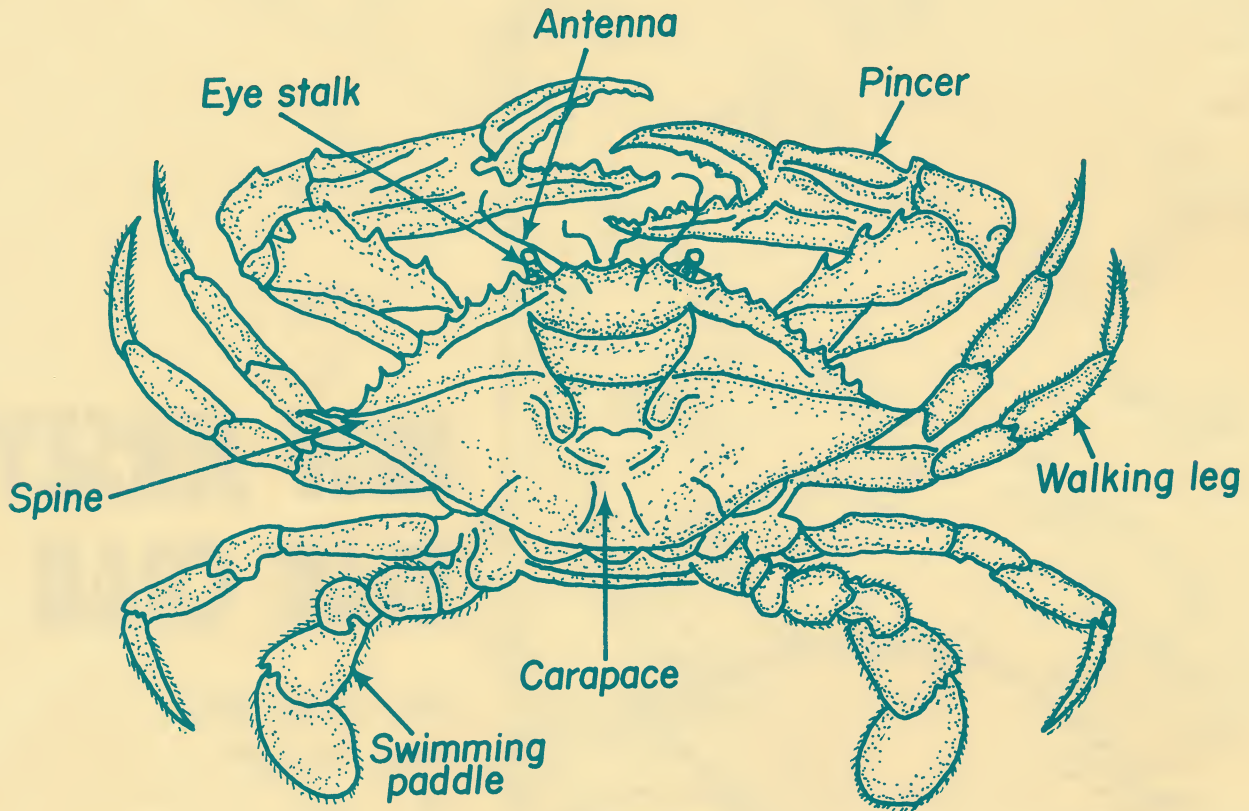


Figure 1.

Of the wide variety of marine animals on the Atlantic coast, none is more well-known by people, young and old, than the blue crab. The crab's abundance, beautiful coloration, pugnacious temperament and delicious flavor make it a favorite of recreational fishermen in New Jersey. Crabbing is a family sport that can be enjoyed by everyone regardless of age or sex and when compared to other forms of recreation, it is relatively inexpensive. In addition to its recreational value, the blue crab also supports an important commercial fishery.

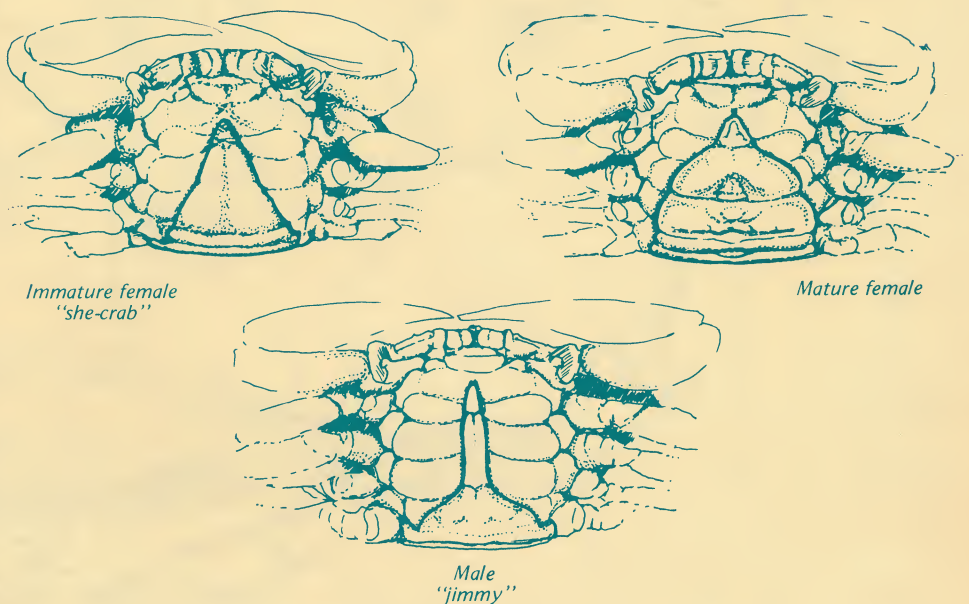


Figure 2.

BIOLOGY AND LIFE HISTORY

Distribution. The crab is common in all the tidal waters of New Jersey from the Hudson River to the Delaware Bay. It occurs from Nova Scotia to Argentina in the western Atlantic and along the coast of northern Europe, from Denmark to France in the eastern Atlantic. In the United States, blue crabs are harvested commercially from Massachusetts southward to Texas. Recently, unintentional introductions of this species have occurred in other areas of the world, such as the Mediterranean Sea. Apparently, crab larvae are carried to these areas in the ballast tanks of ships bound from ports on the east and Gulf coasts.

Appearance. The blue crab is known to scientists as *Callinectes sapidus* (kal i nek' tes sap' i dus). The literal translation of this Latin name is the beautiful (calli) swimmer (nectes) that is savory (sapidus). The blue crab certainly lives up to its name with brilliant blends of olive-green, blue and red, the ability to dart swiftly through the water and a body of delicate, white meat.

Scientists classify crabs as crustaceans (krus ta' shens), which are animals that have jointed bodies and limbs. Crabs are further subdivided into the group known as Decapoda (Dek' e pod a), animals with ten legs. Other members of the Decapoda include shrimp, lobster and crayfish. Basically, there are two types of crabs, those having only walking legs, such as spider, fiddler and rock crabs, and those with the hind pair of legs modified into swimming paddles (Figure 1). The blue crab is a member of the group of swimming crabs and its swimming paddles enable it to pursue prey and escape enemies.

The hard shell of the crab is actually an outer skeleton, called an exoskeleton, which protects the soft body tissues. Although it gives the appearance of a single, continuous structure, the shell is actually formed by the fusion of a number of segments. The shell is elliptical with a large, lateral spine at each end. The back of the shell, or carapace (kar' e pas), is olive-green in color, as is the upper surface of the claws. Blue is the predominant color of the legs and lateral portion of the claws, hence, the name blue claw crab. While the claws of the male may have a hint of red at the very tips, the female crab's are almost completely red.

Distinguishing the Sexes. Besides offering protection, the shell also provides a clue to the life stage and sex of the crab. This information is supplied by the segmented abdomen, known as the apron (Figure 2). The abdomen is folded and fitted snugly into a groove on the underside of the crab. It is pressed tightly against the body during the immature stages, but is loosely fitted in the adult. The male's abdomen is long and slender, resembling an inverted "T". This configuration lasts throughout the male crab's entire life. In the female, however, the triangular apron of the immature changes to the rounded abdomen of the adult during the crab's final molt.

Growth. Although a hard shell protects the crab, it also acts as an obstruction to development. While growth is a continuous process for most species, the crab's size is limited by the confines of its rigid shell. The shell is composed of chitin (ki'tin), a strong but inelastic material that is unable to expand as the body tissues grow and fill the interior body cavities. Thus, the crab cannot increase in size un-

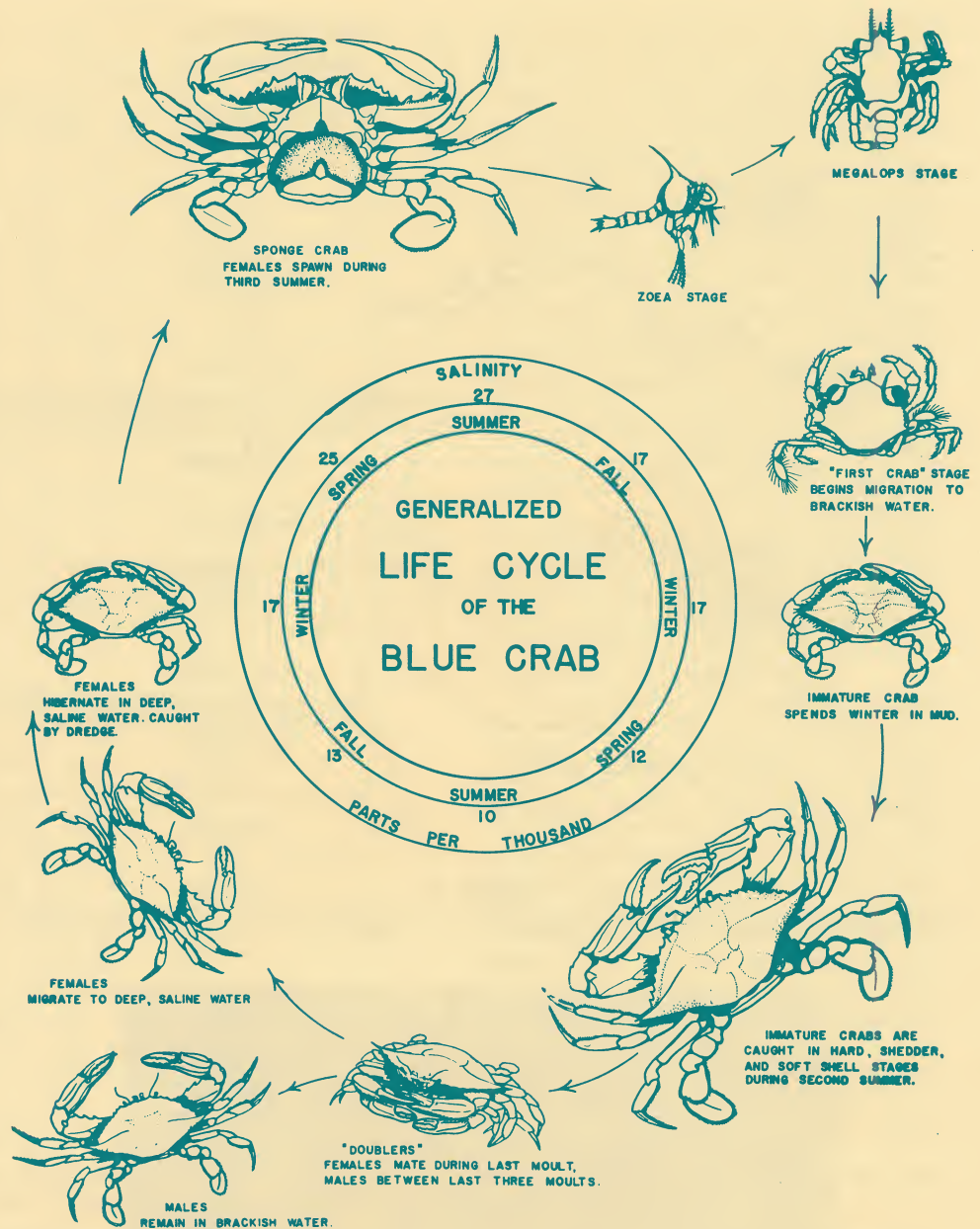


Figure 3.

less it sheds or molts its shell periodically. The intervals between molts vary with the crab's age and time of year. For example, young crabs shed every three to five days during warm months, while older crabs shed at 20 to 50 day intervals. Molting does not take place during cold months when blue crabs hibernate.

The actual molt of the shell is preceded by a complex series of events climaxing with the formation of a new shell beneath the hard exoskeleton. Just prior to shedding, the crab is encased in both the hard, old outer shell and a soft, new one just beneath it. As the molting process proceeds, enzymes erode much of the chitinous material of the old shell. Some

of this material is reabsorbed by the crab and incorporated into its new shell. This is the reason that discarded shells are thin and fragile and quickly decompose.

When the new inner shell is fully developed, the old one splits along the rear of the crab, separating the upper and lower halves of the shell. At this point, the crab is known as a "buster". Once the shell splits, the crab begins to back out of its old encasement. Immediately after the shed, the crab's new shell is pliable and easily stretched. In this condition, the crab is called a "soft crab" or "soft shell crab". Large amounts of water are consumed prior to and shortly after the completion of the molt, causing the shell to expand

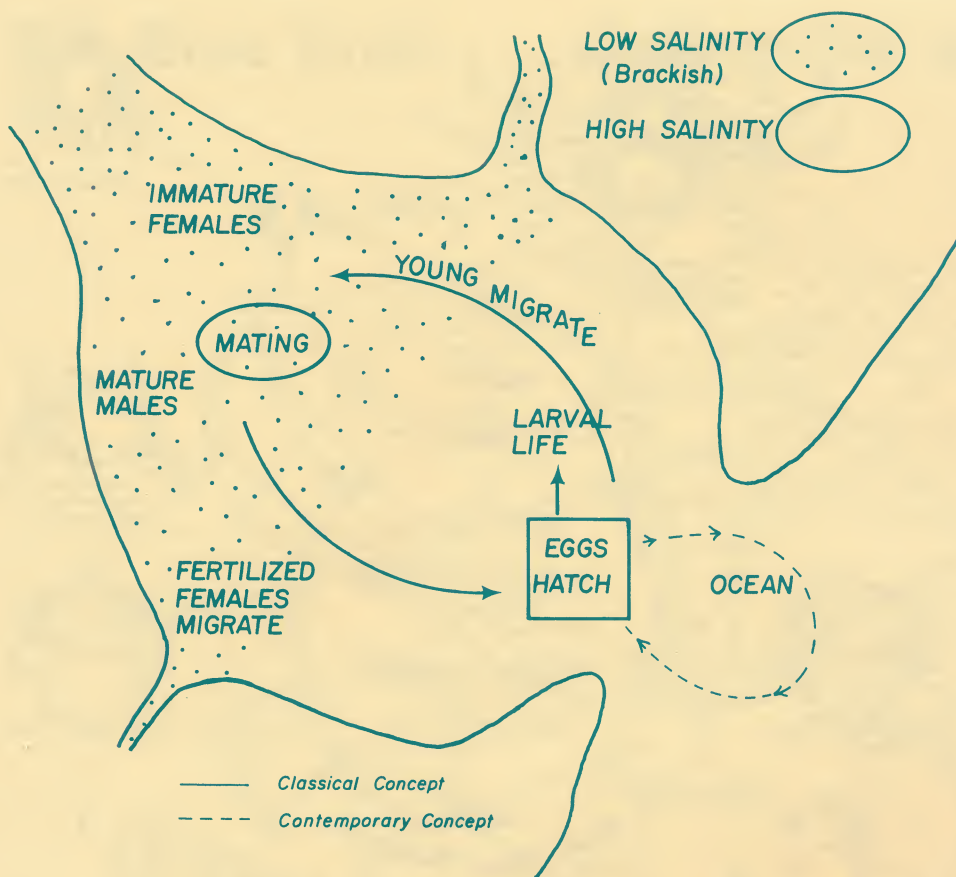


Figure 4.

Movements of blue crabs in a typical bay during the course of their life cycle.



and increase in overall size. This increase may be as great as 33 percent.

A sequence of events prior to shedding enables commercial soft crab fishermen to predict the actual time of the molt. The formation of the new shell is evident along the margins of the swimming paddles. The earliest indication of the new skeleton is the formation of a black line along the rim of the paddles. This line appears white when the crab is within two weeks of the shed and gradually changes to pink when the molting process is within three to six days. When the line is red the crab is within a day of molting. Crabs which have reached the pink or red-rim stage are referred to as "peelers" or "shedders".

The actual process of backing out of the old shell is completed quickly, taking two or three hours. Within two hours after the shed, the shell begins to harden. The "papershell" is reached within 12 hours and an additional two to three days are needed before the shell fully hardens. During the papershell stage and for a few days afterwards, the crab contains little meat. For this reason, many crabbers throw back papershells to fatten up.

The shedding periods are critical times in the life of a crab. During the molt and while in the soft condition, the crab is weak and defenseless and is an appetizing target for almost every species of large fish, as well as other crabs. For this reason, shedders seek protection in shallow eelgrass beds or along marsh banks and pilings.

Mating. Unlike the males that continue to molt and grow throughout their entire lives, growth of the females stops when they reach sexual maturity, usually after 25 molts. During this final molt, mating takes place.

In New Jersey waters, mating occurs from May until October with a peak in the late summer. Just prior to the final molt the immature female, known locally as a "Sally" or "she-crab", is cradled by a mature male or "Jimmie". The male cradles the female by interlacing his front walking legs and claws with hers. The female is escorted in this manner, commonly referred to as a "doubler", for a few days before and after her shed (Figure 3). During the shed, the male releases the female, but remains nearby. After shedding, the female turns onto her back and unfolds her abdomen. The male then transfers his sperm to the female's exposed genital pores. Although the female

The final molt of a female crab, from an immature "she-crab" to a mature "sook". At the top of the photo is the discarded hard shell. On the bottom is the newly-emerged soft-shell crab, which has increased its body size by nearly one-third.

	Spring Spawned Crabs	Fishery		Summer Spawned Crabs
SPRING	HATCH			
SUMMER	LARVAE GROWTH			HATCH LARVAE
FALL	GROWTH 2 1/2 "			GROWTH 1/2"
WINTER	INACTIVE			INACTIVE
SPRING	GROWTH 3"-4"	S		GROWTH
SUMMER	MATURE MATE	P		GROWTH
FALL	SPAWN	P	S	GROWTH 3"-4"
WINTER	INACTIVE MANY DIE	D		INACTIVE
SPRING	SPAWN	P	P	MATURE MATE
SUMMER	SPAWN	P	P	SPAWN
FALL	SPAWN	P	P	SPAWN
WINTER	MOST DIE		D	MOST DIE

Soft crab fishery = S

Pot fishery = P

Dredge fishery = D

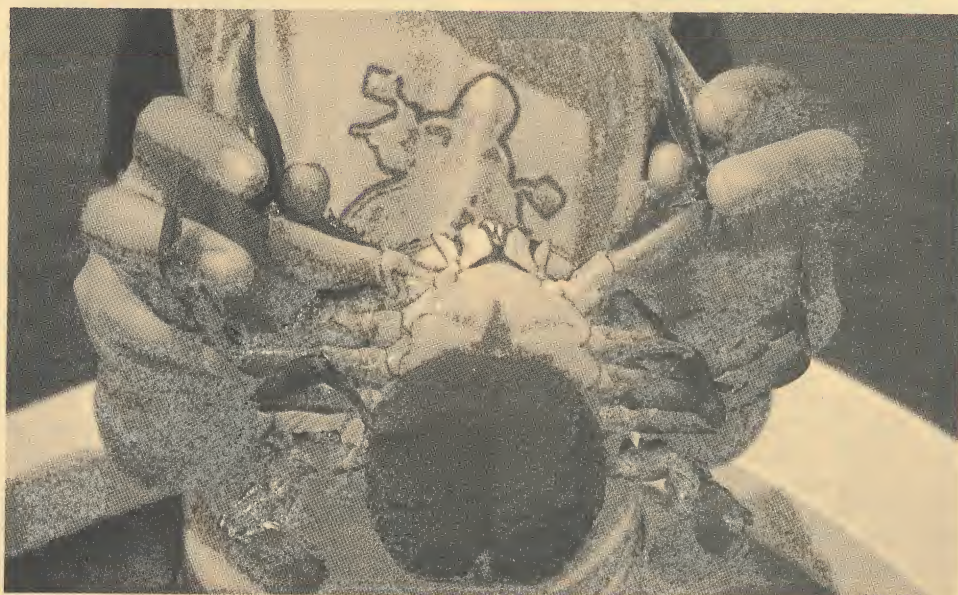
Figure 5.

The development and growth of spring and summer-spawned blue crabs, showing their entrance into sport and commercial fisheries.

mates only once, she may spawn several times. The sperm received during the only mating is stored and used to fertilize the eggs of all future spawnings. After mating, which may take several hours, the two crabs resume the cradle carry until the female's shell hardens.

Life Cycle. Mating usually occurs in the brackish or slightly salty waters of bays (Figure 4). Shortly after mating, the female migrates to higher salinity waters of the bay near the ocean. She shares this journey only with other fertilized females. The adult males and immature females

The underside of a female crab carrying an egg mass or "sponge". The egg mass, which initially is light yellow in color, turns bright orange and then black as the eggs ripen. The eggs in this photo are almost ready to hatch.



remain in the brackish water of the bays and rivers. The survival of the eggs and larvae are dependent upon high salinity water. The seaward migration results in concentrations of fertilized females near the mouths of bays and in the inlets.

The eggs are laid from two to nine months after mating, the length of time depending on when mating took place. Thus, a spring mating will result in a late summer spawn of that year, while a fall mating will result in an early summer spawn the following year. The eggs are deposited and carried on four pairs of feathery appendages sheltered beneath the abdomen. Individual females can produce between 700,000 and 2,000,000 eggs at a single spawning. Because of the mass formed by the eggs, females carrying the large egg mass are called "sponge" crabs. Initially, the eggs are a bright orange. This color gradually changes to yellow and then to a dark brown as the yolks are absorbed and the embryos develop. Hatching occurs in approximately two weeks.

Upon hatching, the young crabs are microscopic in size and drift about as plankton in the water currents. Two theories have been developed to describe larval distribution. The classical theory suggests that larvae remain within the estuary where they develop to maturity. A contemporary theory suggests that hatching occurs with the onset of ebb tide. Concentrated swarms of larvae may be transported out of the estuary by the receding tidal waters and dispersed seaward and to the south. Some larvae may be recruited into the southern estuaries, but the majority of developing larvae are returned to the spawning area by an interaction of seasonal winds and shoreward bottom water circulation patterns.

Regardless of the mechanics of larval



Commercial crabbers baiting their pots on Delaware Bay.

distribution, the larvae will go through two distinctive stages during the first month or so of life (Figure 3), neither of which resembles the parents. The young crab will molt and grow rapidly during early life, finally attaining the appearance of the adult blue crab after approximately seven molts. This "first crab" stage is still very small, about the size of this "0". The crab will continue to grow rapidly and will be approximately one-half inch in size after several weeks. As these juveniles begin to develop their skills of locomotion, they will begin to migrate away from the high salinity waters near the mouth of the estuary to the more brackish regions, where they will eventually mature and mate.

The final size which young crabs reach during their first summer of life depends upon the time of spawning. Crabs hatching out in late summer attain a size of only

half an inch before becoming inactive during the winter. Most of their growth is completed during their second summer. On the other hand, spring-spawned crabs, with the whole summer to grow, reach a size of 2-1/2 inches by their first winter. Thus, spring-spawned crabs grow large enough to be taken by sport and commercial fishermen in their second summer, while summer-spawned individuals do not reach this size until their third summer (Figure 5).

Life Expectancy. Blue crabs grow very quickly and reach maturity in 12 to 18 months. Although the majority do not live beyond two years, a small number may survive for three years. In New Jersey and other northern states, a large proportion of the adult blue crabs perish during the winter.

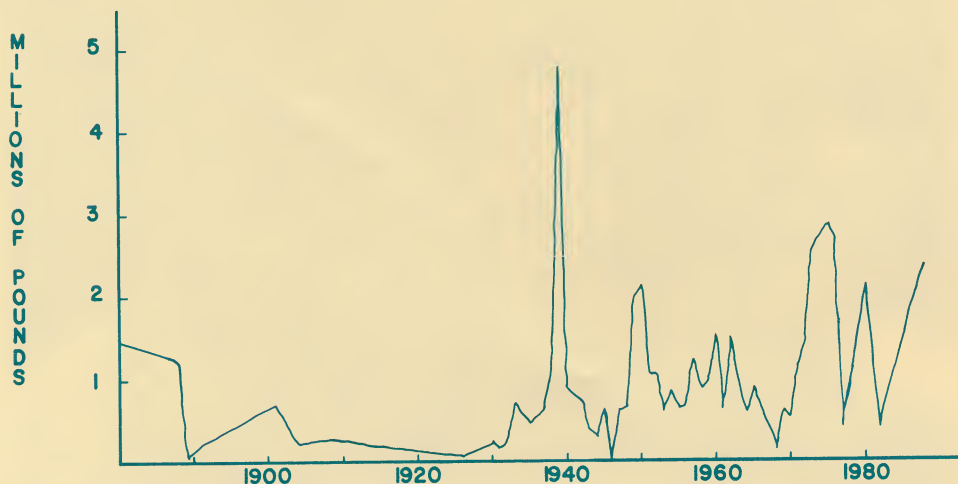


Figure 6.

Commercial blue crab landings in New Jersey, 1880-1985.

Population Abundance. Information collected by marine scientists indicates that the abundance of blue crabs is primarily limited by environmental conditions. Such conditions are critically important in the development of eggs and larvae, which require specific ranges of temperature and salinity. If these ranges are exceeded, the chances for successful development are greatly reduced. For example, abnormal variations in the amount of freshwater that enters a bay has been shown to cause serious declines in crab larvae abundance. In addition, the abundance of adult blue crabs may be dramatically affected by high mortality during severe winters.

Because of the blue crab's great reproductive potential and rapid growth rate, large numbers can result from the spawning of a relatively few individuals under optimal conditions. When this occurs, large catches can often be made by both recreational and commercial fishermen. However, unregulated catches within small areas can severely reduce the local population.

Feeding. Blue crabs are opportunistic and feed on a variety of items, including live and dead fish, other crabs, clams, snails, eelgrass, sea lettuce and decayed vegetation. To catch live fish, they either bury themselves in the sand and wait for a chance to strike with their claws or they actively swim after them. They chip away or crush the shells of clams, oysters, mussels, whelks and other shellfish and are sometimes serious threats to commercial clam beds.

COMMERCIAL FISHERIES

The harvest of blue crabs is important to commercial fishermen in New Jersey. In recent years, the commercial catch has averaged about 1.6 million pounds annually (Figure 6). Prior to the 1940s, the principal gear types used for the harvest of blue crabs were the baited trot line and dredge. Trot lines are very long lines, up to 1,000 feet, on which a hundred or more baits are tied at intervals. This gear is used during the summer when crabs are actively feeding. In operation, the fisherman drifts his boat along the trot line and scoops up the feeding crabs with a net. In the winter, when crabs lay inactive in deep channels, toothed dredges are used to harvest blue crabs. Dredges are dragged behind boats; their teeth dig into the bottom and scrape out the dormant crabs.

The industry was revolutionized in the 1940s by the invention of the self-trapping crab pot (Figure 7), which has proven very effective. Now almost all commercial crabbing in New Jersey is done with crab pots or dredges. The summer crab pot harvest is usually two to four times greater than the winter dredge harvest.



A commercial crabber, working Barnegat Bay, pulls his dredge onboard.



After the dredge is emptied onto a culling table, live crabs are sorted out from dead crabs and debris and packed in bushel baskets for the market.

The majority of the pot fishing occurs in Delaware Bay, although in years of abundance crabs are potted commercially in all of the smaller bays along the Jersey coast. Winter dredging activity is greatest in Delaware and Sandy Hook Bays, but all of the other coastal bays are dredged to some extent.

RECREATIONAL FISHERIES

Of all New Jersey's marine fish and shellfish, more effort is expended in catching the blue crab than any other single species. Recent surveys indicate that three-quarters of the state's saltwater fishermen go crabbing and that crabbing accounts for roughly 30 percent of all marine fishing activity. Recreational crabbing is particularly important in the upper portion of Barnegat Bay, Little Egg Harbor and the Maurice River estuary, comprising 65 to 86 percent of the total recreational harvest in these areas.

Unfortunately, very little is known about the effort expended, the total harvest, and the overall economic value of the recreational crab fishery. Such information is extremely valuable in managing the blue crab resource and in upholding the interests of the state's crabbers.

CRAB REGULATIONS

For up-to-date regulations regarding the recreational and commercial harvest of crabs consult a current issue of the Fish and Wildlife Digest: Marine Edition. Copies are available at many tackle shops or by requesting a copy from:

Division of Fish, Game and Wildlife
Bureau of Marine Fisheries
Nacote Creek Research Station
P.O. Box 418
Port Republic, NJ 08241

RECREATIONAL CRABBING TECHNIQUES

Blue crabs are abundant all along the Jersey coast, in tidal creeks and rivers and in shallow, saltwater bays, from the Hudson River to Delaware Bay. Although most small boats are ideal for reaching crabbing areas, almost any bank, bulkhead, bridge or pier bordering tidal waters can provide excellent crabbing. A list of boat liveries and bay piers is included in this pamphlet.

One of the most popular methods is to use baited lines or traps from the bank or a boat. The most common baits are menhaden (bunker) and chicken necks, but any fresh fish will work well. Many fishermen save the racks from filleted fish for crab bait. A very inexpensive bait line can be made by tying a 6 oz. sinker and a large (8/0) hook to one end of 15 to 20 feet of cord. A short stick is tied to the other end and used to secure the bait line on the bank and to store the cord.

Most crabbers operate 5 to 10 bait lines, checking them every few minutes. When a crab is felt tugging on the bait, retrieve the line slowly and steadily until the feeding crab is close enough to be scooped up with a long-handled dip net. Don't lift the crab out of the water with the line.

There is also a variety of wire and net traps that are used to catch crabs. They are particularly effective when used from a bridge.

When crabbing from a boat, it is a good idea to use both hand lines and traps for sometimes one will work better than the other. It is also effective to anchor your boat at the bow and stern to prevent unnecessary movement of the baits and traps. Use fresh bait. After several hours of dunking, the bait will lose much of its attractant odor and should be replaced with a fresh piece.

Another technique, especially effective for soft or sheddar crabs, is to wade the

shallows with a scoop net. This method works only when the water is clear and calm. Crabs can also be scooped from marsh banks and around bridge pilings and bulkheads.

One of the best and easiest methods for holding your catch is a bushel basket with a lid. Keep the basket in the coolest place possible. Your catch will keep at least a day in this manner. Avoid leaving crabs in direct sunlight, especially during the summer months. Do not put crabs in a bucket of water for they will soon use all of the available dissolved oxygen and drown. Closed containers and plastic bags will also kill your catch. To transport crabs long distances, put them in a cooler with ice.

COOKING AND PICKING CRABS

Before cooking, rinse crabs in freshwater, making sure they are all alive. If a crab's legs and claws hang limp and show no signs of movement it is probably dead and **should be discarded**. Crabs may be steamed or boiled, depending on your preference.

Drop the live crabs into a large pot of boiling water and cook for 8 to 10 minutes. The shells will turn a bright red. Many people add "seafood boil" or Old Bay seasoning to the water to give the crab meat a spicy flavor. After cooking, remove the crabs from the water and allow them to cool before picking out the meat.

To clean a hard crab, remove the carapace shell by lifting the apron and pulling forward. Rinse out the internal organs and finger-like gills. Then snap off the mouthparts, legs and claws. The edible meat is contained within the claws and the two thin-shelled compartments on either side of the body. Remove the meat from the body by breaking open the compartments or by cutting across them

laterally with a knife. Crack the claws open with a knife or a nutcracker.

Crab meat spoils rapidly and must be refrigerated as soon as possible. Do not rinse the picked meat for this will remove much of its delicate flavor. Crab meat can also be frozen and stored. It should be packed tightly in freezer containers and frozen as soon as possible after picking. To prevent freezer burn during long periods of storage, pour a brine solution of one teaspoon of salt dissolved in a quart of water over the packed meat.

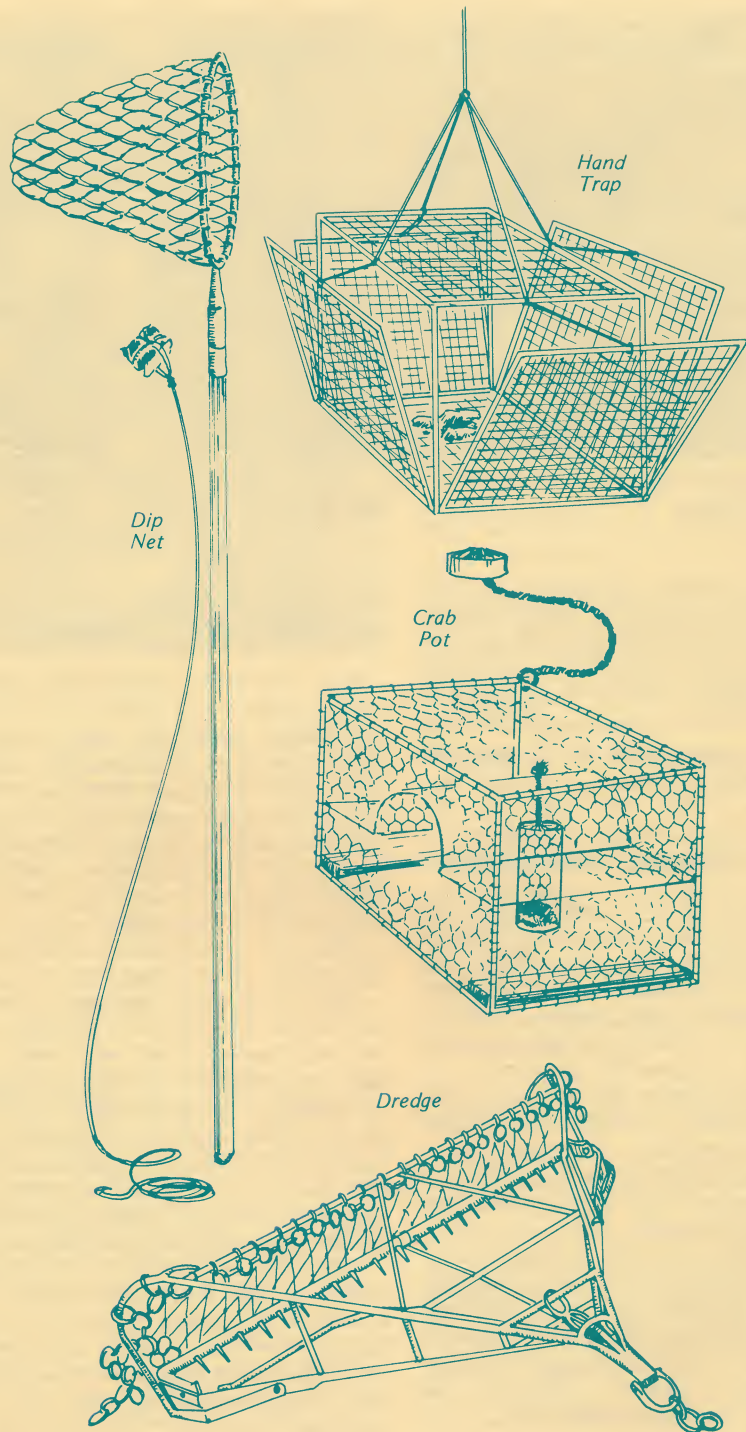
With soft crabs, very little preparation is needed. They should be cleaned while still alive. Cut away the mouthparts and eye-stalks, lift the carapace and remove the feather-like gills. The rest is edible. To store, wrap in plastic and freeze.

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